Ambient Sulphur Dioxide and Particulate Levels in the Vicinity of Abitibi-Price Inc. Pine Falls, Manitoba. March-April, 1983

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Air Standards and Studies
Report No. 83-3

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ABSTRACT

At the request of the Air Pollution Control Section of Environmental Control Services, the Mobile Monitoring Unit carried out a study to determine ambient ground level concentrations of sulphur dioxide and particulate in the area surrounding the Abitibi-Price Inc. pulp and paper mill, in the Town of Pine Falls, Manitoba.

Results from the study indicate that ambient sulphur dioxide and particulate levels are within both the maximum acceptable and the maximum desirable levels as delineated by the Manitoba Air Quality Objectives.

INTRODUCTION

At the request of the Air Pollution Control Section of Environmental Control Services, a short study was undertaken by the Mobile Monitoring Unit to monitor ambient levels of sulphur dioxide (SO_2) and particulate in the vicinity of Abitibi-Price Inc., in the Town of Pine Falls, Manitoba. The objective of this study was to determine whether air quality, when impacted by air emissions from Abitibi, meets criteria set out in the Manitoba ambient air quality objectives for SO_2 and particulate, and to determine areas where potentially elevated levels might exist.

The surveys for this study were carried out on March 28, 29 and April 13, 14, 1983. Sampling was performed during these days as meteorological conditions permitted. The following sections summarize the sampling and monitoring procedures used, and the results of this study.

PROCEDURES

Using meteorological information coupled with visual observation, sampling sites were picked adjacent to Abitibi-Price Inc., directly within the exhaust plume if possible. The Mobile Monitoring Unit (MMU) was set up in this position, and the sampling manifold was attached, allowing a sample to be obtained approximately three and one half metres above ground level.

Monitoring was performed using a Thermo Electron Model 43 pulsed fluorescent ambient SO_2 analyzer. Pulsating ultraviolet light is focused through a narrow bypass filter into a fluorescent chamber. Sulphur dioxide molecules are excited to a higher energy state in the chamber and then give off a decay radiation characteristic for SO_2. This radiation is allowed to pass selectively through a second filter to impinge onto a photomultiplier tube. The light emissions are processed electronically, such that the light energy is converted into a voltage signal which is proportional to the concentration of sulphur dioxide in the sample being analyzed. This method is highly specific, with few interferences.

Sampling for particulate was performed according to Environment Canada method no. EPS 1-AP-73-2, using a high volume air sampler into which a pre weighed Gelman glass fibre filter was emplaced. A large volume of air (250-300 cubic metres) was drawn through the filter, trapping any suspended particulate. The exposed filters were then taken back to the W.M. Ward Technical Services Laboratory for analysis.

A number of problems exist which are intrinsic to the mobile monitoring process itself. In some cases, access to areas affected by emissions from a plant is extremely limited, thus hampering monitoring operations, as representative samples cannot be obtained. Adverse meteorological conditions are also found to severely affect the sampling process. Automated, overnight sampling at one location is found to generate little meaningful data, unless

the MMU is frequently checked, as wind conditions are not normally constant over a long monitoring period. At these times during a survey, data obtained is limited, and in most cases, represents background concentrations of the compound being analyzed. Background levels are noted in the text of the discussion section.

Results of this study are calculated on the basis of time weighted averages (TWA). These values represent the average concentration of a specific pollutant over a given sampling period. Peak concentrations are also given for sulphur dioxide, and represent the highest instantaneous value monitored during the sampling period.

RESULTS

Table 1 summarizes ambient ground level sulphur dioxide concentrations around Abitibi-Price Inc. presented as one hour time weighted averages (TWA) in units of parts per million (ppm).

Table 2 lists total suspended particulate results, represented as twenty-four hour time weighted averages in units of micrograms per cubic metre of air (ug/m^3).

TABLE 1: Ambient Sulphur Dioxide (SO_2) Ground Level Concentrations Around Abitibi-Price Inc., Pine Falls.
(for specific sampling locations, see map of Pine Falls area, Appendix 1).

DATE AND TIME	LOCATION	1 HOUR TWA (ppm)	PEAK CONCENTRATION (ppm)	COMMENTS
March 28, 1983 11:57 a.m.-12:57 p.m.	Service Road west of Abitibi	0.06	0.20	wind E-SE, light; wood pulp odor; faint SO_2 odor.
March 28, 1983 1:02 p.m.- 2:02 p.m.	Service Road west of Abitibi	0.04	0.15	wind E-SE, light; wood pulp odor.
March 28, 1983 2:07 p.m.- 3:07 p.m.	Service Road west of Abitibi	0.01	0.03	wind NE, light; no discernible odors.
March 28, 1983 4:05 p.m.- 5:05 p.m.	Southeast of Abitibi on Hwy #11 near Maple & Pine Sts.	0.06	0.19	wind NW, light; wood pulp odor; faint SO_2 odor
April 13, 1983 9:09 a.m.-10:09 a.m.	South of Abitibi on Hwy #11 between railway tracks	0.02	0.04	wind N-NW, moderate; wood pulp odor.
April 13, 1983 10:14 a.m.-11:14 a.m.	South of Abitibi on Hwy #11	0.02	0.04	wind N-NW, moderate; wood pulp odor.
April 13, 1983 11:19 a.m.-12:19 p.m.	South of Abitibi on Hwy #11	0.01	0.04	wind N-NW, moderate; wood pulp odor.

Cont'd

TABLE 1: Ambient Sulphur Dioxide (SO_2) Ground Level Concentrations Around Abitibi-Price Inc., Pine Falls. (for specific sampling locations, see map of Pine Falls area, Appendix 1).

DATE AND TIME	LOCATION	1 HOUR TWA (ppm)	PEAK CONCENTRATION (ppm)	COMMENTS
April 13, 1983 12:24 p.m.- 1:24 p.m.	South of Abitibi on Hwy #11	0.02	0.05	wind N-NW, moderate, wood pulp odor.
April 13, 1983 3:15 p.m.- 4:15 p.m.	South of Abitibi on Hwy #11	0.02	0.04	wind N-NW, moderate, wood pulp odor.
April 13, 1983 7:05 p.m.-8:05 p.m.	South of Abitibi on Hwy #11 between railway tracks	0.02	0.03	wind N-NW, moderate, wood pulp odor.
April 14, 1983 8:55 a.m.- 9:55 a.m.	South of Abitibi on Hwy #11	0.03	0.10	wind N-NW, moderate, fumigation around plant; wood pulp odor.
April 14, 1983 10:00 a.m.-11:00 a.m.	South of Abitibi on Hwy #11	0.01	0.03	wind N-NW, moderate; wood pulp odor.
April 14, 1983 11:05 a.m.-12:05 p.m.	South of Abitibi on Hwy #11	0.01	0.02	wind N-NW, light; wood pulp odor.

TABLE 2: Ambient Ground Level Concentrations of Total Suspended Particulate in the Vicinity of Abitibi-Price Inc., Pine Falls.
(for specific sampling locations, see map of Pine Falls area, Appendix 1).

DATE	LOCATION	TOTAL SUSPENDED PARTICULATE 24 Hour TWA (ug/m^3)	COMMENTS
March 28/83	Clearing north west of Abitibi	16	Wind blowing from south east; plume heading away from sampling site.
March 29/83	Clearing northwest of Abitibi	12	Wind blowing from south east; plume heading away from sampling position.
March 29/83	Papertown Motel	9	Hi Vol set up to measure background particulate concentration in Pine Falls area.
April 13/83	South of Abitibi on Hwy #11	64	Abitibi plume blowing directly over Mobile Monitoring Unit position.
April 13/83	South of Abitibi on Hwy #11	45	Abitibi plume blowing south west of Mobile Monitoring Unit position.

OBSERVATIONS

A variety of meteorological conditions were observed during the two surveys of this study. On March 28, light winds were observed at ground level, while air masses stratified at higher levels caused the Abitibi plumes to shift through one hundred eighty degrees, from east-southeast to northwest during the course of the survey. A steady north-northwest wind, gusting from 30 to 60 kilometers per hour was present throughout the survey conducted on April 13 and 14. An inversion in the upper atmosphere during this period caused ground impingement of the Abitibi plumes between 8:00 and 9:30 a.m. on April 13, and 8:00 to 11:00 a.m. on April 14, with general fumigation of the surrounding area which, in some cases, obscured the plant from view.

Two incidences occurred during the second survey, on April 13 at 1:40 p.m. and April 14 at approximately 10:00 a.m., in which a strong odour of burnt wood was detected around the Abitibi plant. A heavy plume was emitted from the main stack at this time, with fumigation of the fields south-southwest of the plant, producing a haze which lasted approximately fifteen minutes after each emission. It is thought that waste wood was being burnt by the Abitibi operation during these periods.

DISCUSSION

The surveys which are described in the previous sections are not comprehensive and should not be considered as such, due to the many factors which may affect emissions from industrial operations. However, some conclusions from the data can be obtained. First, all ambient sulphur dioxide ground level concentrations around Abitibi-Price Inc. were found to be within both the maximum acceptable level (0.34 ppm) and the maximum desirable level (0.17 ppm) based upon a one hour TWA, as set out in the Manitoba ambient air quality objectives.

From observations performed during the study. there appears to be a correlation between increased instantaneous ambient sulphur dioxide levels and visually observed emissions from the exhaust stacks for the acid digestion process. Emissions from the main stack were found to result in instantaneous values as high as 0.05 ppm; however, when conditions were favorable for monitoring the cumulative effects from all stacks, instantaneous values as high as 0.20 ppm were detected. Background levels for sulphur dioxide in the Pine Falls area were found to be below the lower detection limit of the instruments(<0.002 ppm).

Values for total suspended particulate from Abitibi-Price Inc. were all found to be well below the maximum acceptable level concentration of 120 ug/m^3 based upon a 24 hour TWA, as set out in the Manitoba air quality guidelines.

APPENDIX 1
MAP OF PINE FALLS AREA

Nº 180 B

(UNINCORPORATED)

PINE FALLS

TP. 18, RGE. 9E.

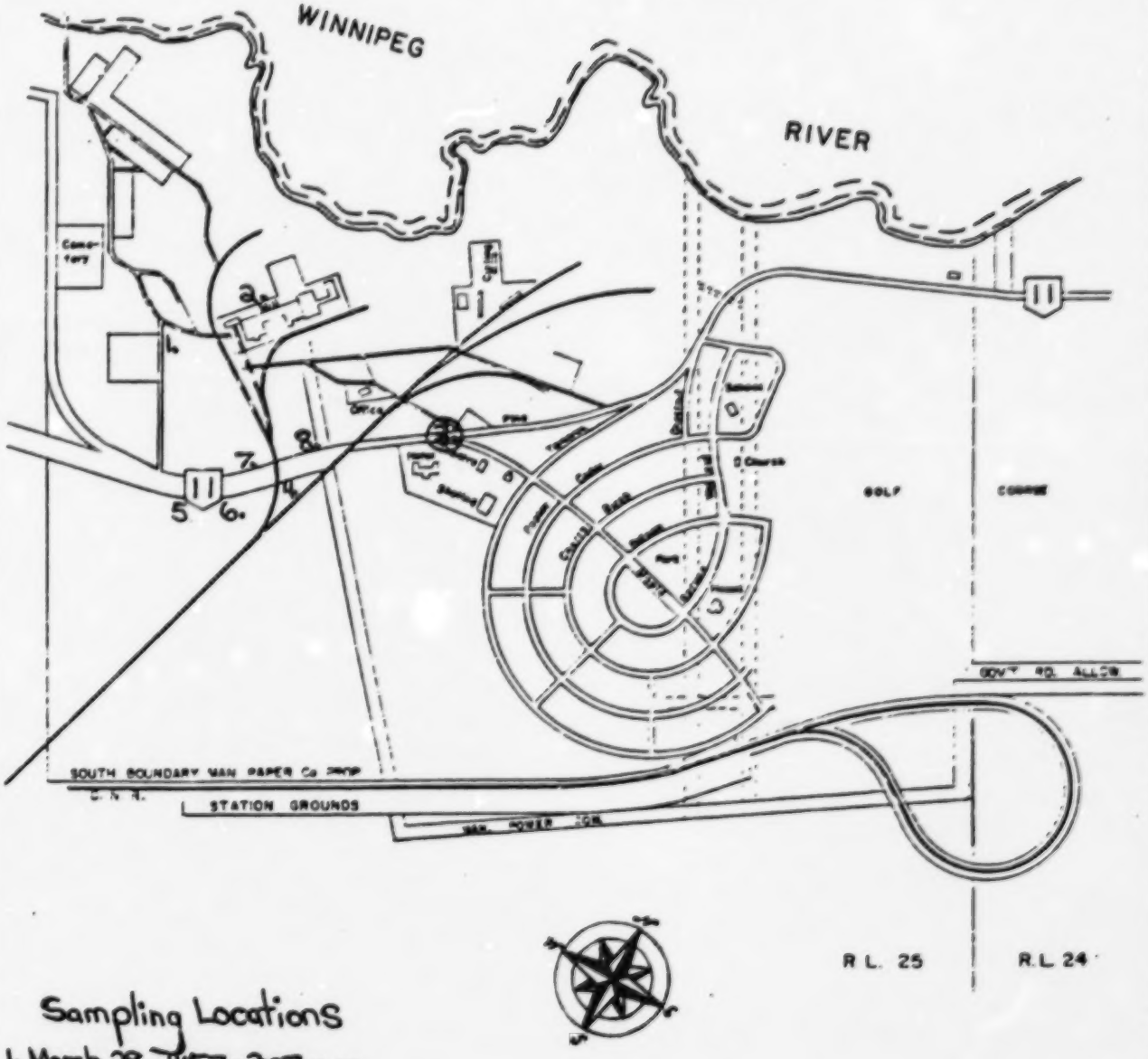
RUPERTSLAND UNORGANIZED

SCALE : 1" = 1000'

PROVINCE OF MANITOBA
HIGHWAYS DEPARTMENT
DISTRICT Nº 1

WINNIPEG, DECEMBER 1965

REVISED: JAN. 1968



Sampling Locations

1. March 28 11:57 - 3:07 p.m.
a. Abitibi Price Inc.
3. March 28 4:05 - 5:05 p.m.
4. April 13 9:09 - 10:09 a.m.
5. April 13 10:14 - 11:14 a.m.
6. April 13 11:19 a.m. - 1:24 p.m.
7. April 13 3:15 p.m. - 4:15 p.m., April 14 8:55 a.m. - 12:05 p.m.
8. April 13 7:05 - 8:05 p.m.

POOR

QUALITY

ORIGINAL